2. *Cyclostoma orophilum,* nobis, n. s.

Testa anguste umbilicata, globoso-conica, sub epidermide non nitente olivacea, albida, versus apicem acuminatum nigrescente; spira elevata, conica, attenuata, sutura distincta; anfractibus 5, convexis, ultimo rotundato, lineis 9 elevatiusculis, subtus remotioribus munito; apertura parum obliqua, circulari; peristomate tenui, recto, anfractui penultimo breviter adnato, labio expansiusculo; umbilico non pervio.
Diam. major 9, minor 7, alt. $7\frac{1}{2}$ mill.
Hab. ad Monahagalla vicum montanum interiorem Insulæ Ceylon. Teste Edgar L. Layard.

Allied to the Point de Galle *C. halophilum,* nobis, but differing in sculpture and in the acuminated spire. It belongs to *Leptopoma* of Pfeiffer.

3. *Cyclostoma liricinctum,* nobis, n. s.

Testa depressa, orbiculata, albida, liricincta, ad intervalla radiato-striata; spira vix elevata, apice obtuso, suturis excavatis; anfractibus $3\frac{1}{2}$ convexiusculis, ultimo rotundato, liris 8 cincto; apertura subcirculari, oblique superne angulata; peristomate recto, acuto; umbilico lato, perspectivo. Operculo corneo, tenui, multispirato.
Diam. major 4, minor $3\frac{1}{2}$, alt. 2 mill.
Hab. ad oras Australiæ Occidentalis. Dr. J. F. Bacon.

The penultimate whorl shows three elevated lines which are diminished to two in the upper whorl. Its place seems to be in Pfeiffer's 10th section of *Cyclophorus.*

4. *Cyclostoma orbiculatum,* nobis, n. s.

Testa depressa, orbiculata, albida, oblique striata, liris nonnullis, præcipue subtus, munita; spira elevatiuscula, sutura excavata, marginata, exiliter striata; anfractibus 4, convexis, ultimo rotundato; apertura subcirculari, obliqua, superne angulata, subcanaliculata; peristomate simplici; umbilico aperto, perspectivo. Operc.?
Diam. major $3\frac{1}{2}$, minor 3, axis 2 mill.
Hab. cum præcedente.

Malvern, January 4, 1853.

X.—*On the Animal of* Chamostrea albida.

By Albany Hancock, Esq.

[With Two Plates.]

Having been favoured by John Whichham Flower, Esq. of Croydon, with a specimen in spirits of *Chamostrea albida,*—the

Cleidothærus chamoides of Stutchbury, and believing that a description of the animal would be acceptable to malacologists, I have drawn up the following account of it; which, though imperfect, I trust will assist in determining the position that this anomalous genus ought to have in the classification.

It will be seen that this animal differs too much from the *Anatinidæ* to be placed with them; but that it seems to accord pretty well with the *Chamaceæ*; nevertheless I am unable to say whether or not it is a true member of this latter family, for I can find no sufficiently detailed account of the animal of *Chama* to allow of a critical comparison. Such comparison, however, can very easily be made by any one who may happen to possess the requisite knowledge of that genus.

It is unnecessary to give any description of the shell, that being already well known; although it is proper to state that the convex or attached valve is the right,—the flat or free valve the left.

On removing the animal from the shell the mantle is found to be rather thick, less transparent than usual, and of a pretty regular, pale brownish colour; the two lobes, of course, being unequal, corresponding with the irregular development of the valves, are united throughout, the pedal and siphonal apertures being the only openings, except a minute orifice to be afterwards described. The borders (Pl. III. fig. 1 *a*) of the anterior margin are, however, free so far back as the anterior adductor muscle (*d*); and a little below this they become closely united for a short distance, the border of the right lobe projecting a little beyond that of the left. This point (*b*) corresponds to the angle of the shell produced by its adhesion to its support. Just above this point and close to the lower extremity of the adductor is the pedal opening (*c*), which is small and circular. The muscle forms the upper margin of the orifice, its fibres being exposed between the borders of the mantle, for more than half its length; in fact it here becomes the wall of the branchial chamber, closing up, as it were, a large portion of the pedal aperture, and reducing it to its present limited dimensions. Behind the point where the borders of the mantle are united, they (*e*) again separate, forming a sort of recess external to the union of the lobes, and from which the siphonal tubes (*f*, *g*) issue; this recess extends as far as the posterior adductor (*h*). From thence up to the dorsal region the mantle-borders are again united, forming in these parts a sharp edge. Immediately below the beak the ossicle (*j*) passes diagonally through both lobes of the mantle, and is surrounded at either end with a membranous expansion (*k*); these expansions are developments of the lobes, and are undoubtedly for the purpose of providing for the growth of the ossicle. Close

by and a little anterior to the beak, the margin of the conjoined mantle is deeply sinuated or notched (*l*) to permit of the passage of the tooth. The margins of the lobes are smooth, a little thickened and grooved throughout, and for some short distance within are well supplied with radiating muscles which are attached along the pallial line, and are for the purpose of drawing in the free borders.

The siphonal tubes (Pl. III. fig. 1 *f*, *g*, & Pl. IV. fig. 2) are quite distinct, and are placed a little apart; they are situated lower down than usual, being almost ventral, are short and wide with the walls rather thin, and with both orifices encircled by minute simple papillæ. Besides the siphonal apertures there are other two,—one, the pedal (Pl. III. fig. 1 *c*), has already been described; the other (*m*) is comparatively minute, and is situated a little in front of the lower or inhalant tube, and in the angle of the recess formed by the opening of the mantle-borders. A similar fourth aperture exists in several,—perhaps in most of the *Lamellibranchiata* with closed mantles. I have observed it in *Lutraria*, *Cochlodesma*, *Panopæa*, and *Myochama*, and Professor Owen has described a fourth orifice in *Pholadomya*. It would seem probable that this fourth aperture is to allow the escape of the contained water when the tubes are suddenly withdrawn and the valves contracted, as always happens when the animal is startled. It might be supposed that the pedal orifice would be sufficient for this purpose; but it must be recollected that in all these animals it is comparatively minute, and is placed towards the anterior extremity. The contraction being instantaneous, this fourth aperture, which is situated at the posterior end of the chamber, would seem necessary to prevent undue pressure in this region, while the pedal orifice will sufficiently relieve the parts in front.

The anterior adductor muscle (Pl. III. fig. 1 *d*) is long, narrow, and slightly arched outwards, and has the upper extremity pointed, and rather suddenly curved inwards; the lower extremity is rounded. The posterior adductor (*h*) is much shorter and thicker in proportion to its length than the anterior, is somewhat arched outwards and has both extremities rounded.

On laying open the mantle, the body (fig. 2 *a*) is seen suspended from the dorsal and posterior walls of the chamber, the anterior adductor (*b*) forming the boundary in front; immediately below this muscle is the pedal orifice (*c*), and in the ventral wall, towards the posterior margin, project the two large, partially retracted siphonal tubes (*d*, *e*), and a little in advance of them is the fourth minute aperture (*f*) with slightly projecting margin. The gills (*g*, *g'*) lie near the centre of the chamber suspended from above and behind; they are large, of an irregularly rounded

or oval form, and are united at a point below; at first sight they appear to be composed of a single plate on each side of the body; but we shall presently see that this is not the fact. The body, stretching downwards from between the gills, is of an oval form, and gradually subsides into a small, compressed linguiform foot (*i*) which projects forwards. The mouth (Pl. III. fig. 2 & Pl. IV. fig. 1 *j*) is placed above, exactly in front of the body, and is a rather large transverse slit, furnished with the usual four appendages or palps (*k*, *k'*), which are well developed, and are divided into a superior and an inferior pair, between which the upper anterior margin of the gill-plate of each side is inserted. They are flat, leaf-like, slightly tapering, and rather obtusely pointed; the external surface is smooth, as well as the margin of the external border of the inner or opposing surfaces. This surface, however, is for the greater part laminated, each palp being furnished with thirty transverse laminæ, inclined towards the free extremity. The palps are united above and below the mouth by widish membranes; that above forming a sort of hood which overhangs the oral orifice.

To return to the gills;—The apparent single plate lying on each side of the body is found, on close examination, to be divided longitudinally by an obscure line (Pl. III. fig. 2 *h*) into two portions, the anterior (*g*) being much the larger; this portion is formed of two laminæ in the usual manner. These laminæ are united internally at several points, forming the interbranchial space into a transverse series of tubes (*l*) as in most of the *Lamellibranchiata*. This portion, then, is a complete gill-plate, and is attached to the body of the animal above, from the side of the mouth as far as the line defining its boundary behind; and is suspended from behind by a membrane (*m*), which extends the entire length of the gill, its junction with the membrane being indicated externally by the longitudinal line already alluded to. Thus on each side of the body, along the posterior or dorsal margin, there is formed a large channel (*n*) into which the interbranchial tubes open, and likewise the oviducts. The posterior portion (*g'*) of the supposed single gill-plate is narrow, and is found to be composed of only a single lamina; it is therefore a rudimentary gill, and forms a sort of flap attached by its whole length to the external lamina of the gill-plate; its under surface, dorsal and posterior margins being free. *Chamostrea* has consequently only a single gill, and a rudimentary gill on each side of the body.

The branchial organ of *Cochlodesma* is arranged much in the same manner; but in it the rudimentary portion is attached throughout, there being no free margin. In *Chamostrea* we have just seen that the rudimentary gill is a flap-like appendage,

though I would not positively assert that this is its natural condition, for the animal had been removed from the shell before it came into my possession, and these parts are so delicate that very little violence is sufficient to rupture them. I could not, however, perceive the least appearance of laceration, and there is therefore little doubt that the above description is correct.

It is difficult to say whether the gill-plate represents the outer or the inner plate of other Lamellibranchs. In *Mytilus*, which has two perfect gill-plates, there is also an external rudimentary gill formed, as in this instance, of a single lamina. It would seem probable, therefore, that the breathing organ of *Chamostrea* represents the outer plate together with the rudimentary gill of that genus.

The branchia of *Chamostrea* being reduced to little more than a single gill-plate on each side of the body, some complication of the apparatus might be expected as a compensation for the deficiency; and such is found to be the fact. If the laminæ composing the plate are divided, their inner surface is found to be formed of a reticulation of blood-vessels running at right angles to each other; those (Pl. IV. fig. 4 *a*) extending across the lamina, predominating considerably in size, give to the surface a corded appearance in a transverse direction, the cords being separated by a series of apertures (*c*). On turning the lamina over, the outer surface is ascertained to be covered with numerous delicate transverse plaits or folds (fig. 3 *a*), so crowded together as to conceal the true surface. When a transverse section of the lamina is made, these plicæ (fig. 5 *a*, *a*) are seen to coincide with the spaces between the large transverse vessels seen on the under surface of the lamina, and are consequently placed over the series of apertures (*d*, *d*) between these vessels. The plicæ themselves are formed of double walls, enclosing a wedge-shaped space with its base towards the lamina. These walls are made up entirely of a very minute network of vessels (fig. 6 *a*, *b*) which cross each other at right angles, the meshes being open, and elongated in the direction of the plicæ. This structure is perfectly similar to that of the gill-laminæ of *Mya*, *Pholas*, &c.; and the nutritive particles will be strained from the surrounding element by the surface of the plicæ, just in the same way as the gill-lamina itself strains the water in other Lamellibranchs; that is to say, the water by ciliary action will be made to pass through the apertures or meshes, leaving behind all sedimentary matters, and, escaping into the wedge-shaped spaces between the walls of the plicæ, will find its way at once, by the series of apertures between the large, transverse, cord-like vessels of the gill-laminæ, into the interbranchial spaces or tubes; and as these latter open freely into the great dorsal or posterior channel which commu-

nicates with the exhalant siphon, the stream will pass readily out of the animal.

The minute structure of the rudimentary gill is precisely similar to that of the laminæ forming the gill-plate; and the plicæ of the former are continuous with those of the latter. The sedimentary matters will therefore, in all probability, pass from one to the other, and be collected, as usual, along the free anterior margin (fig. 1 *l, l*) of the gill, which margin is provided with an ample groove (fig. 7 *a*) for the purpose, formed by the projection of the plicæ (*b, b*) of both sides; and in this manner the nutriment will be conducted to the mouth.

The water strained through the rudimentary gill will pass along the dorsal or posterior margin external to the membrane which defines the great channel at the root of the gill-plate, and thus reach the exhalant siphon, which is provided at its internal orifice with two lateral membranous processes (Pl. III. fig. 2 *o*); these are united below, partially separating the two tubes; above each forms an angulated lobe which projects forward as far as the lower extremity of the rudimentary gill, and is undoubtedly for the purpose of guiding the excurrent branchial streams to the siphonal outlet. This membranous process is apparently the rudiment of the septum which completes the separation of the tubes in the *Pholades*, and in several other Lamellibranchs.

The alimentary system presents nothing very peculiar. The œsophagus is well defined, moderately long, and ascends a little as it passes backwards to reach the upper portion of the stomach, which is irregularly rounded; below it becomes suddenly constricted, and is prolonged almost to the lower extremity of the body, where it terminates in a blind sac. In this elongated portion there is a narrow plait of the lining membrane extending near its whole length, and giving off on either side short, alternate branches. The biliary ducts are seven or eight in number; five or six of these enter the superior portion of the stomach,—two the inferior prolongation; but these latter were not very distinct. I did not succeed in tracing the whole of the intestine; but it appears to me to leave the upper portion of the gastric organ behind, just above the commencement of the inferior prolongation; and passing a little upwards and backwards, curves round the upper extremity of the posterior adductor, and then coursing along its external margin, terminates below it in a short, free, tubular anus within the base of the exhalant siphon: the margin of the anus is entire. Thus it would appear that the intestine is shorter than usual. It is possible, however, that the above description may, on further examination, require modification;

for in dissecting the tube upwards from the anus, I lost it just before it reached the stomach; I may have been deceived, therefore, as to its path on leaving this organ. And perhaps the inferior prolongation of the gastric cavity is what in other Lamellibranchs has been called the duodenum.

I saw no "crystalline style," neither did I detect the "tricuspid body"; the former most likely does not exist, the latter has probably escaped me.

EXPLANATION OF THE PLATES.

PLATE III.

Fig. 1. View of right side of *Chamostrea albida* enclosed in the mantle:—*a*, anterior borders of the two lobes of the mantle turned back; *b*, the point at which the borders are united; *c*, pedal orifice; *d*, anterior adductor muscle; *e*, borders of the ventral margin separated a little to show siphonal tubes; *f*, exhalant tube; *g*, inhalant tube; *h*, posterior adductor; *i*, posterior margin; *j*, extremity of ossicle; *k*, membranous process surrounding same; *l*, notch for the passage of tooth; *m*, fourth minute aperture leading into branchial chamber.

Fig. 2. View of left side of animal, the mantle laid open:—*a*, body; *b*, anterior adductor; *c*, pedal aperture; *d*, inhalant siphon; *e*, exhalant siphon; *f*, fourth aperture leading into branchial chamber; *g*, gill-plate; *g'*, rudimentary gill; *h*, line dividing the two portions of branchial organ; *i*, foot; *j*, mouth; *k*, oral palps; *l*, orifices of interbranchial tubes; *m*, membrane suspending gill; *n*, the two great posterior channels; *o*, two membranous flaps in connexion with exhalant siphon; *p*, the two extremities of ossicle; *q*, processes for secreting ossicle; *r*, notch in mantle for passage of tooth.

PLATE IV.

Fig. 1. Front view of mouth:—*a*, body; *j*, oral orifice; *k*, *k*, superior pair of palps; *k'*, inferior ditto ditto; *l*, anterior border of gill-plate, exhibiting groove.

Fig. 2. Siphonal tubes as they would appear when in action.

Fig. 3. A portion of external surface of gill-lamina:—*a*, transverse plicæ; *b*, extremities of plicæ extending beyoud lamina.

Fig. 4. A portion of under surface of gill-lamina:—*a*, large transverse vessels; *b*, small vessels; *c*, series of apertures.

Fig. 5. Transverse section of lamina of gill-plate:—*a*, *a*, plicæ on external surface; *b*, *b*, large transverse vessels seen on under surface of lamina; *c*, *c*, small vessels of ditto; *d*, *d*, series of apertures.

Fig. 6. A portion of the wall of plicæ highly magnified:—*a*, vessels running in the direction of plicæ; *b*, vessels running in the opposite direction; *c*, apertures.

Fig. 7. Margin of gill-plate much enlarged, exhibiting groove:—*a*, groove; *b*, *b*, extremities of plicæ of the opposite sides.